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Utah Economic and Business Review

Volume 49
Number 1
January 1989

BEBR

graduate school
of business
bureau of economic and
business research
university of utah

FORECASTING UTAH'S INDUSTRIAL ELECTRICAL ENERGY REQUIREMENTS

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The University of Utah's Bureau of Economic and Business Research (BEBR) recently completed a project for the Utah Public Service Commission, involving the development of a capability for forecasting industrial electrical energy requirements in the State of Utah. The ostensible fruit of this effort was a set of forecasts of electrical energy requirements in Utah's manufacturing sectors out to the year 2010 (which are presented in Tables 1 and 2 below). But the actual numerical forecasts are of secondary importance to the realization of the modeling capability that was used to produce these forecasts. This capability was achieved through the implementation of a set of models known as the Industrial End-Use Planning Methodology (INDEPTH) econometric models.

INDEPTH Models

The INDEPTH econometric models were developed by Synergic Resources Corporation (SRC) as part of the Industrial End-Use Planning Methodology project sponsored by the Electric Power Research Institute. These models constitute a system designed to forecast industrial electricity consumption at the state or electrical utility service area level for each of the federal government's 2-digit Standard Industrial Classification (SIC) manufacturing sectors. There are a set of models for each of the 2-digit sectors, which have been derived upon the basis of cost-minimization assumptions. These models belong to a class of models that are referred to by SRC as KLEFM (capital, labor, electricity, fuels, materials). The notion is that industrial customers of electric utilities attempt to minimize the cost of producing any given level of output by adjusting the inputs of capital, labor, electricity, fuels and materials so as to achieve the least possible cost, given time and resource adjustment constraints.

Generally speaking, SRC estimated the parameters of four different models for each of the 2-digit manufacturing sectors using pooled time series and cross section data obtained from the Censuses of Manufactures and Annual Surveys of Manufactures. The four different models include the following forms: (1) Constant Elasticity of Substitution, (2) Static Translog, (3) Variable Cost Translog and (4) Variable Cost Generalized Leontief. Among the four different models SRC has expressed an industry specific starting recommendation for each of the 2-digit manufacturing sectors on the basis of statistical goodness of fit and how mathematically well behaved the parameterized model is. SRC suggests though, that other models be considered for a specific utility service area, because performance is partly a function of utility-specific price inputs.

For each of the different models the demand (or expenditure share) for each class of production input is modeled as a function of the prices of each of the production inputs. The Constant Elasticity of Substitution Model employs the simple CES form. The CES models are dynamic, in the sense of incorporating a lagged response to changes in energy prices, and are also globally optimal. The other three models incorporate a flexible functional form, meaning that certain technical optimizing conditions may not necessarily be satisfied by the estimated parameters. The Static Translog Model uses the translog functional form. It is a static model, and thus predicts an instantaneous response to changes in input prices. The two variable cost models are dynamic models. They treat capital as a quasi-fixed factor to model the dynamic responses of firms to change in input prices.

With certain exceptions, all four models require as inputs forecasts of real or inflation-adjusted values of the following exogenous variables:

- Price of electricity (mills per kwh)
- Price of natural gas ($ per million cubic feet)
- Price of oil ($ per barrel)
- Price of coal ($ per short ton)
- Average wage ($ per hour)
- Price of materials index
- Capital price index (static translog model only)
- Capital stock (variable cost models only)

Ideally, the forecasts of each of these variables should be 2-digit industry specific. However, it should be realized that it may not be practicable to differentiate several of the price variables on an industry-specific basis.

The Bureau of Economic and Business Research (BEBR) has implemented the INDEPTH Level 1 modeling system for at least one model form for each of the 2-digit manufacturing sectors in the State of Utah.

Exogenous variable forecasts except for the real price of electricity were undertaken by BEBR. The general nature of the future path of real electricity prices was suggested by Utah Power & Light. The remainder of the implementation effort involved assembling a historical time series for each of the model variables, and calibrating the model parameters to capture regional production function differences and to insure consistency of the model forecasts with historical service area industrial electricity usage. Calibration of the models took either of two forms: (1) estimation of an intercept term for each of the models, using service area specific data on total production cost and shares of total cost for each of the inputs in the base year; or (2) multiplicative calibration, which simply involves determination of a multiplicative constant, i.e., actual base year electricity consumption divided by predicted consumption. This latter calibration procedure calibrates forecasted electricity consumption directly, with elasticity parameters being unaffected.

BEBR has produced forecasts of industrial electrical energy consumption for the years 1986 through 2010 at the 2-digit level of detail for the State of Utah using both the Constant Elasticity of Substitution and Static Translog Models. Time and resource constraints prohibited the implementation of the Variable Cost Translog and Generalized Leontief Models.

Forecast Results

The forecast results are shown in Tables 1 and 2 below. Table 1 presents the forecasts of Utah manufacturing electrical energy consumption generated by the Static Translog Model, while Table 2 presents the forecasts of Utah manufacturing electrical energy consumption generated by the Constant Elasticity of Substitution model. It should be noted that tobacco manufacture in Utah is nil and that leather products manufacture is negligible, so that no forecasts have been made for these two sectors.

It should further be noted that SRC did not provide Constant Elasticity of Substitution Model parameter estimates for five sectors: furniture and fixtures; printing and publishing; chemicals; fabricated metal products; and machinery. Thus these five sectors are not represented in the Constant Elasticity of Substitution forecasts. For that same reason no manufacturing total electrical energy consumption numbers are included in the CES Model forecasts shown in Table 2.

Data Preparation

Historical estimates of the values of the exogenous variables were generated from several different data sources, including principally the 1982 Census of Manufactures and the Annual Surveys of Manufactures from 1981 through 1986. These data were supplemented with electricity price data calculated from revenue and kilowatt-hour data for Large Power Users (LPU) provided by Utah Power & Light Company and natural gas price data for industrial customers provided by Mountain Fuel Supply Company.

Industry specific price of electricity indices were calculated from the LPU data. This data series covered the years 1981-88 except for the textile and apparel

Table 1

Utah Static Translog Model
Electrical Energy Requirements Forecasts by Manufacturing Sector
[Millions of Kwh]

Year	Food Prod.	Tex-tiles	Clo-thing	Lumber Prod.	Furn-iture	Paper Prod.	Print. & Pub.	Chem-icals	Petrol. Prod.	Rubber Prod.	Stone Prod.	Prim. Metals	Metal Prod.	Mach-inery	Elect-ronics	Transp. Equip.	Instru-ments	Misc. Mfg.	Total
1986	135.3	2.6	38.3	25.9	16.0	58.4	53.7	879.3	425.9	21.9	546.4	687.8	63.2	267.5	216.4	242.7	58.3	19.0	5,744.3
1987	151.0	2.7	41.3	24.7	18.9	48.7	66.1	1124.0	447.5	24.3	526.3	675.9	70.1	304.6	236.3	258.0	59.4	20.9	6,087.8
1988	175.7	8.0	40.7	28.2	15.8	61.8	101.0	1376.0	482.2	25.9	518.4	1026.5	60.2	342.7	265.5	285.7	66.9	28.4	6,897.7
1989	183.5	8.1	41.4	28.5	16.1	62.5	103.3	1399.6	510.9	26.2	524.0	1040.9	61.1	393.0	268.1	289.7	75.6	29.0	7,050.4
1990	191.5	8.2	42.1	28.8	16.3	63.2	105.5	1423.5	540.2	26.5	529.5	1055.4	62.0	444.8	270.8	293.7	84.6	29.5	7,206.1
1991	199.7	8.3	42.8	29.1	16.6	63.9	107.9	1448.0	569.8	26.7	535.1	1070.2	62.9	498.0	273.4	297.8	93.8	30.1	7,365.1
1992	208.0	8.4	43.5	29.4	16.8	64.7	110.3	1472.7	599.9	27.0	540.7	1085.1	63.9	552.8	276.0	301.9	103.4	30.7	7,527.0
1993	216.5	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	630.4	27.3	546.3	1100.2	64.8	609.0	278.6	306.0	113.2	31.2	7,692.1
1994	222.1	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	655.6	27.3	546.3	1100.2	64.8	657.0	278.6	306.0	121.3	31.2	7,780.0
1995	227.8	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	680.8	27.3	546.3	1100.2	64.8	705.0	278.6	306.0	129.3	31.2	7,867.9
1996	233.4	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	706.1	27.3	546.3	1100.2	64.8	752.9	278.6	306.0	137.3	31.2	7,955.8
1997	239.1	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	731.3	27.3	546.3	1100.2	64.8	800.9	278.6	306.0	145.4	31.2	8,043.7
1998	244.7	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	756.5	27.3	546.3	1100.2	64.8	848.9	278.6	306.0	153.4	31.2	8,131.6
1999	250.4	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	781.7	27.3	546.3	1100.2	64.8	896.9	278.6	306.0	161.4	31.2	8,219.4
2000	256.0	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	806.9	27.3	546.3	1100.2	64.8	944.9	278.6	306.0	169.5	31.2	8,307.3
2001	261.7	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	832.2	27.3	546.3	1100.2	64.8	992.8	278.6	306.0	177.5	31.2	8,395.2
2002	267.3	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	857.4	27.3	546.3	1100.2	64.8	1040.8	278.6	306.0	185.6	31.2	8,483.1
2003	273.0	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	882.6	27.3	546.3	1100.2	64.8	1088.8	278.6	306.0	193.6	31.2	8,571.0
2004	278.6	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	907.8	27.3	546.3	1100.2	64.8	1136.8	278.6	306.0	201.6	31.2	8,658.8
2005	284.3	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	933.0	27.3	546.3	1100.2	64.8	1184.8	278.6	306.0	209.7	31.2	8,746.7
2006	289.9	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	958.2	27.3	546.3	1100.2	64.8	1232.8	278.6	306.0	217.7	31.2	8,834.6
2007	295.6	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	983.5	27.3	546.3	1100.2	64.8	1280.7	278.6	306.0	225.7	31.2	8,922.5
2008	301.2	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	1008.7	27.3	546.3	1100.2	64.8	1328.7	278.6	306.0	233.8	31.2	9,010.4
2009	306.9	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	1033.9	27.3	546.3	1100.2	64.8	1376.7	278.6	306.0	241.8	31.2	9,098.3
2010	312.5	8.5	44.2	29.7	17.1	65.4	112.7	1498.0	1059.1	27.3	546.3	1100.2	64.8	1424.7	278.6	306.0	249.8	31.2	9,186.1

Source: Bureau of Economic and Business Research

sectors, where there were no Large Power Users in the period 1981-1986. For these two sectors the price of electricity indices were based on the average price paid by non-LPU industrial customers. The indices were used to project forward the 1981 industry-specific average price benchmark prices calculated from data contained in the 1982 Census of Manufactures.

For the prices of natural gas, oil and coal, the only Utah specific data available were found in the 1982 Census of Manufactures (containing fuels and electricity data by state for the year 1981.) In the case of natural gas, SIC specific data were available only for limited number of sectors: food; petroleum; stone, clay and glass; primary metals; fabricated metals; machinery; and electronics. In the rest of the sectors, the Utah specific natural gas price was calculated and used (by subtracting all of the SIC specific data from the Utah totals and then computing the average price for the remaining sectors). Having computed a price for natural gas for all sectors for the year 1981, the price for the years 1982-1988 was calculated by multiplying the benchmark price by an industrial customer price index for those years, calculated from data supplied by Mountain Fuel Supply Company.

For coal and oil, the 1982 Census of Manufactures fuels data were used to compute a Utah-specific 1981 price (no SIC specific data were used). This 1981 price was multiplied by an index calculated using U.S. industry-specific average price data provided by SRC.

The price of labor was calculated for each SIC sector by using data published in the Annual Surveys of Manufactures and the 1982 Census of Manufactures. These data were not disclosed for some SIC sectors for the years 1982-84, but were supplied for every sector in years 1984-86. As recommended by SRC, the price of labor was calculated by assuming that the average number of hours worked by production workers held for all employees in the sector, and the total payroll of the sector was divided by the estimated total employee work-hours to arrive at an estimated average price of labor for each 2-digit SIC sector.

For lack of better data for the price of materials and price of capital indices, the U.S. average values used by SRC to estimate the model parameters were employed for purposes of implementing the Utah models. The quantity of real output was computed by using the value of shipments in each of the sectors provided in the Annual Surveys of Manufactures and the 1982 Census of Manufactures. These data, like the fuels data, was not completely disclosed for each sector for the years 1981-83, but were published for every sector for the years 1984-86. The time trend indices were kept at the constant values used by SRC in estimating the model parameters. Finally, to obtain real values, all of the exogenous variable price and output variables were deflated using the Producer Price Index for Total Manufactures as recommended by SRC.

For forecast purposes all exogenous variables except two were assumed to hold constant out to the year 2010. For the years 1987 and 1988 output was assumed to increase proportionally with LPU electricity consumption. Output for most sectors was held constant from 1988 through the year 2010, except for the following sectors: food and kindred products; petroleum and coal products; machinery; and instruments. These historical growth sectors were assumed to grow from 1988 to 1989 by the following percentages: food and kindred products, 3 percent; petroleum and coal products, 5 percent; machinery 13 percent; and instruments, 11 percent. These percentages were based on the average rate of growth of real Gross State Product in these sectors over the period 1981 through 1986. The values of these increments were then assumed to hold for each succeeding year for the years 1990-2010, reflecting an assumption of linear growth rather than exponential growth.

After 1988, real electricity prices were projected to decrease by 2 percent per year through the year 1993, and then were projected to hold constant to the end of the forecast period. These projections were based on a scenario suggested by Utah Power & Light to reflect the economies expected to result from the merger with Pacific Power & Light.

Model Calibration

For the Utah Static Translog Model the multiplicative calibration approach was selected for most sectors, including food and kindred products; apparel; lumber and wood products; furniture and fixtures; paper products; printing and publishing; petroleum and coal products; rubber and plastics; primary metals; fabricated metal products; machinery; and instruments. Electricity consumption in these sectors in 1986 was projected from the 1981 value shown in the 1982 Census of Manufactures on the basis of the relative change in real Gross State Product between 1981 and 1986.

The multiplicative calibration approach was also employed in chemicals; stone, clay and glass products; and electronic equipment. However, since Large Power User consumption in these sectors in 1986 exceeded the value projected on the basis of the relative change in real Gross State Product, total consumption in the sector in 1986 was estimated by expanding LPU consumption in the sector by the ratio of total statewide employment in the sector to employment in the UP&L Utah service area. Implicit in this procedure is the assumption that non-LPU consumption in these three sectors in the UP&L Utah service area was negligible. Finally, in textiles;

transportation equipment; and miscellaneous manufacturing the intercept adjustment approach was employed. The fuel share adjustment parameters used for this purpose were derived by scaling down the U.S. parameters estimated by SRC, using value of shipments as the scaling factor.

The multiplicative calibration approach was used exclusively for calibrating the Utah Constant Elasticity of Substitution Model, using the base year electricity consumption values derived for the Utah Static Translog Model. This of course implies that base year (1986) forecasts for the two models will be identical. In addition, it implies that any differences in the forecasts generated by the two models for subsequent years must be due exclusively to differences in sensitivities to electricity price changes, since the values of the other exogenous variables (other that real output) were held constant throughout the forecast period.

Concluding Observations

It should be emphasized that the forecasts presented in Tables 1 and 2 are not intended to be definitive forecasts of Utah's future industrial electrical energy requirements, but rather illustrative of the forecasting capabilities of the INDEPTH econometric models. Certainly the forecasts are no better than the price and output assumptions that went into producing the forecasts. However, these assumptions do possess ample plausibility.

An examination of the forecasts in Table 1 suggests considerable variation in electricity price sensitivity among the different manufacturing sectors. Indeed, the Static Translog Model price elasticity of demand for electricity in printing and publishing is more than twice as great as in electronic equipment (-1.09 compared to -0.46 at prices prevailing at the end of the forecast period). A comparison of the forecasts in Table 1 with those in Table 2 also reveals some differences in electricity price sensitivity estimates between the Static Translog Model and the Constant Elasticity of Substitution Model, though for most sectors the forecasts are relatively close.

Prior to the so-called energy crisis most electrical utilities relied on some sort of naive forecasting approach that took little or no account of the market realities faced by industrial consumers of electrical energy. It is not surprising that so many utilities vastly underestimated the effect of substantial electricity price increases in the 1970s and early 1980s. The INDEPTH models provide an explicit structural framework for avoiding the sort of errors that arise due to a failure to recognize that industrial customers are, in fact, responsive to changing prices of electricity and other fuels, as well as to changing product demand.

Table 2
Utah Constant Elasticity of Substitution Model
Electrical Energy Requirements Forecasts by Manufacturing Sector
[Millions of Kwh]

Year	Food Prod.	Tex-tiles	Clo-thing	Lumber Prod.	Paper Prod.	Petrol. Prod.	Rubber Prod.	Stone Prod.	Prim. Metals	Elect-ronics	Transp. Equip.	Instru-ments	Misc. Mfg.
1986	135.3	2.6	38.3	25.9	58.4	425.9	21.9	546.4	687.8	216.4	242.7	58.3	19.0
1987	155.2	2.7	41.3	24.9	52.7	437.0	23.6	522.5	743.1	231.1	249.7	58.3	20.2
1988	185.6	7.0	40.6	28.6	63.0	469.9	24.5	519.0	1006.3	254.0	261.9	63.5	23.7
1989	194.6	7.0	41.3	29.0	63.6	492.8	24.7	524.8	1021.2	261.8	262.0	70.5	23.7
1990	204.7	7.1	41.9	29.4	64.2	517.1	24.8	531.1	1031.7	268.9	262.8	77.7	23.8
1991	215.4	7.1	42.6	29.9	64.8	542.1	24.9	537.4	1040.6	275.0	263.7	85.1	23.9
1992	226.6	7.2	43.4	30.3	65.4	567.5	25.0	543.9	1048.7	280.1	264.9	92.6	24.0
1993	238.1	7.2	44.1	30.8	66.0	593.4	25.1	550.5	1056.6	284.6	266.1	100.3	24.1
1994	247.1	7.2	44.1	30.8	65.9	611.6	25.0	550.3	1055.6	286.7	265.2	106.8	24.1
1995	256.6	7.2	44.1	30.8	65.8	629.9	25.0	550.3	1055.2	288.6	264.8	113.4	24.0
1996	266.3	7.2	44.1	30.8	65.8	648.1	25.0	550.3	1055.0	290.0	264.5	120.0	24.0
1997	276.1	7.2	44.0	30.8	65.8	666.2	24.9	550.3	1055.0	291.1	264.4	126.6	24.0
1998	286.1	7.2	44.0	30.8	65.8	684.2	24.9	550.3	1055.0	292.0	264.3	133.2	24.0
1999	296.3	7.2	44.0	30.8	65.8	702.1	24.9	550.3	1054.9	292.7	264.2	139.8	24.0
2000	306.5	7.2	44.0	30.8	65.8	719.8	24.9	550.3	1054.9	293.3	264.1	146.3	24.0
2001	316.9	7.2	44.0	30.8	65.8	737.4	24.9	550.3	1054.9	293.7	264.1	152.8	24.0
2002	327.4	7.2	44.0	30.8	65.8	754.9	24.9	550.3	1054.9	294.0	264.0	159.3	24.0
2003	338.0	7.2	44.0	30.8	65.8	772.3	24.9	550.3	1054.9	294.3	264.0	165.8	24.0
2004	348.7	7.2	44.0	30.8	65.8	789.6	24.9	550.3	1054.9	294.5	264.0	172.3	24.0
2005	359.5	7.2	44.0	30.8	65.8	806.8	24.9	550.3	1054.9	294.6	264.0	178.8	24.0
2006	370.5	7.2	44.0	30.8	65.8	823.9	24.9	550.3	1054.9	294.7	263.9	185.2	24.0
2007	381.6	7.2	44.0	30.8	65.8	840.9	24.9	550.3	1054.9	294.8	263.9	191.7	24.0
2008	392.7	7.2	44.0	30.8	65.8	857.8	24.9	550.3	1054.9	294.9	263.9	198.1	24.0
2009	404.0	7.2	44.0	30.8	65.8	874.6	24.9	550.3	1054.9	294.9	263.9	204.5	24.0
2010	415.4	7.2	44.0	30.8	65.8	891.4	24.9	550.3	1054.9	295.0	263.9	210.9	24.0

Source: Bureau of Economic and Business Research

Utah Business Statistics

UTAH DATA	Oct 1987	Oct 1988	% Change From Year Ago	12 Month Average This Year	12 Month Average Last Year	12 Month Average % Change
Total Personal Income (seasonally adjusted) (mil. of dol.) (qtly.)	19,603	NA	NA	NA	18,809.3	NA
New Corporations (no.)	474	323	-31.9%	452.3	459.3	-1.5%
New Car, Truck and Motor Home Sales (no.)	4,755	2,301	-51.6%	4,837.9	5,061.8	-19.1%
Agriculture						
Average Prices Recorded by Farmers (dol.)						
Beef Steers and Heifers (cwt) (thous.)	63.80	70.60	10.7%	67.2	62.6	7.4%
Lambs (cwt)	69.50	61.80	-11.1%	64.8	72.4	-10.5%
Milk Wholesale (cwt)	12.10	12.40	2.5%	11.6	12.0	-3.9%
Alfalfa Hay, Baled (per ton)	69.00	79.00	14.5%	74.4	66.3	12.2%
Cattle Slaughtered (live weight) (thous. of lbs.)	43,449	47,341	9.0%	46,220.3	41,051.7	12.6%
Construction						
Total Construction (thous. of dol.) (c)	135,451	106,121	-21.7%	118,299.8	120,335.7	-1.7%
Residential	45,796	42,779	-6.6%	46,961.7	51,846.7	-9.4%
Nonresidential	69,596	39,694	-43.0%	40,361.5	39,730.1	1.6%
Public Works and Utilities	20,059	23,648	17.9%	31,012.5	28,758.2	7.8%
Total Permit Construction (thous. of dol.) (d)	93,013.6	74,149.4	-20.3%	73,093.5	93,391.4	-21.7%
Residential	37,293.5	40,312.8	8.1%	34,494.7	43,607.5	-20.9%
Nonresidential	41,856.2	18,920.4	-54.8%	25,175.0	36,020.6	-30.1%
Additions, Alterations and Repairs	13,863.9	14,936.2	7.7%	13,424.7	13,763.3	-2.5%
New Dwelling Units (no.)	495	516	4.2%	476.8	670.0	-28.8%
Employment						
Civilian Labor Force (thous.)	756.8	765.6	1.2%	755.4	756.3	-0.1%
Total Employed Persons	716.8	732.7	2.2%	716.1	708.2	1.1%
Unemployed Persons	40.0	32.9	-17.8%	39.3	48.1	-18.4%
Percent Total Labor Force	5.3	4.3	-18.9%	5.2	6.4	-18.4%
Employees on Nonagricultural Payrolls (thous. of jobs)	648.0	670.6	3.5%	651.7	638.6	2.0%
Manufacturing	95.2	99.2	4.2%	96.3	91.6	5.1%
Mining	8.3	8.1	-2.4%	8.3	7.9	5.2%
Contract Construction	27.1	26.8	-1.1%	24.4	27.5	-11.4%
Transportation, Communication and Utilities	38.5	40.4	4.9%	38.9	37.7	3.1%
Wholesale Trade	34.6	34.9	0.9%	34.7	35.1	-1.3%
Retail Trade	117.6	121.6	3.4%	118.8	117.9	0.8%
Finance, Insurance and Real Estate	33.4	32.9	-1.5%	33.6	33.7	-0.2%
Services (a)	151.5	162.5	7.3%	155.0	145.3	6.7%
Federal Government	39.0	39.4	1.0%	39.5	40.0	-1.3%
State Government(b)	38.2	38.6	1.0%	37.8	37.9	-0.3%
Local Government(b)	64.8	66.2	2.2%	64.6	63.8	1.2%
Average Weekly Hours						
Manufacturing	39.7	41.0	3.3%	40.6	39.4	3.1%
Mining	42.1	40.6	-3.6%	42.8	41.4	3.4%
Wholesale Trade	38.9	37.3	-4.1%	37.8	37.8	0.2%
Retail Trade	27.9	28.4	1.8%	28.1	28.1	0.1%
Amount of Unemployment Compensation (thous. of dol.)	4,809.0	3,609.9	-24.9%	5,955.3	8,452.4	-29.5%
Finance						
Savings, Savings and Loan Association (mil. of dol.)	2,474.8	2,401.9	-2.9%	2,353.6	2,447.3	-3.8%
Tax Collections by the State of Utah (thous. of dol.)						
Total Tax Collections	85,901.9	118,489.8	37.9%	147,601.2	135,624.4	8.8%
Sales and Use Tax	19,065.1	32,256.0	69.2%	53,210.3	47,469.6	12.1%
Motor Fuel Tax	12,471.1	13,551.6	8.7%	10,934.6	8,801.3	24.2%
Individual Income Tax	26,109.5	49,416.8	89.3%	53,811.8	47,120.1	14.2%
Corporation Franchise Tax	9,687.8	9,678.0	-0.1%	5,965.1	6,247.4	-4.5%
Production						
Net Electric Power Utilized (mil. of kwh)	1,160.1	1,199.8	3.4%	1,237.1	1,146.7	7.9%
Crude Oil to Refineries (thous. of bbls.)	3,735.5	NA	NA	NA	3,823.1	NA
Crude Oil (thous. of bbls.)	3,047.2	2,724.2	-10.6%	2,808.2	2,999.9	-6.4%
Natural Gas (mil. of cu. ft.)	25,011.8	22,417.8	-10.4%	23,094.0	21,315.0	8.3%
Coal (thous. short tons)	1,713.0	1,423.0	-16.9%	1,510.9	1,130.6	33.6%
Tourism/Travel						
Air Passengers (total no. on and off) (S.L. Int'l Airport)	767,093	796,415	3.8%	861,473.0	842,657.3	2.2%
Highway Traffic Count Across State Lines	37,185	40,603	9.2%	NA	38,070.8	NA
Transient Room Taxes (thous. of dol.)	248.3	275.6	11.0%	563.8	457.7	23.2%
Visits, State, Nat'l. Parks, Monuments (thous.)	890.7	1,004.7	12.8%	1,101.6	1,057.5	4.2%
Utilities						
Telephone Lines in Service (Mt. Bell) (Residential)	483,603	492,321	1.8%	487,111.6	478,752.2	1.7%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	177,961	183,361	3.0%	180,117.0	174,759.8	3.1%
Electric Customers (Residential)	473,304	477,303	0.8%	475,919.3	471,795.8	0.9%
Electric Customers (Commercial)	45,937	46,939	2.2%	46,691.0	46,128.8	1.2%
Natural Gas Customers (Residential & Commercial)	443,530	457,494	3.1%	457,314.3	445,067.8	2.8%
Natural Gas Customers (Industrial)	553	556	0.5%	547.9	556.5	-1.5%

Utah Business Statistics

UTAH DATA	Oct 1987	Oct 1988	% Change From Year Ago	12 Month Average This Year	12 Month Average Last Year	12 Month Average % Change
Davis County						
Non-Ag. Employment (thous.)	52.4r	53.5fo	2.1%	52.4	52.3	0.2%
Unemployment Rate	4.7r	4.1	-12.8%	4.6	5.4	-14.7%
Auth. Permit Construction (thous. of dol.)	7,805.6	7,200.4	-7.8%	9,409.2	12,786.8	-26.4%
New Dwelling Units (no.)	79	74	-6.3%	68.8	97.1	-29.2%
Postal Receipts (thous. of dol.)	335.2	450.8	34.5%	406.6	NA	NA
Electric Customers (Residential)	47,691	48,256	1.2%	48,038.8	47,040.5	2.1%
Electric Customers (Commercial)	3,304	3,446	4.3%	3,425.3	3,265.8	4.9%
Natural Gas Customers (Residential)	48,645	50,407	3.6%	50,146.6	48,536.5	3.3%
Natural Gas Customers (Industrial)	52	53	1.9%	52.4	51.8	1.3%
Telephone Lines in Service (Mt. Bell)(Residential)	54,468	55,770	2.4%	55,124.1	54,707.7	0.8%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	10,681	11,577	8.4%	11,193.5	10,466.5	6.9%
Salt Lake County						
Non-Ag. Employment (thous.)	335.3r	345.4fo	3.0%	338.1	332.7	1.6%
Unemployment Rate	4.8r	4.1	-14.6%	4.8	5.5	-12.6%
Auth. Permit Construction (thous. of dol.)	45,160.8	32,746.5	-27.5%	32,757.1	44,471.1	-26.3%
New Dwelling Units (no.)	185	194	4.9%	180.1	267.5	-32.7%
Postal Receipts (thous. of dol.)	6,956.5	8,548.7	22.9%	7,931.3	7,179.8	10.5%
Electric Customers (Residential)	237,181	240,062	1.2%	239,151.8	235,770.3	1.4%
Electric Customers (Commercial)	20,027	20,438	2.1%	20,353.1	19,834.4	2.6%
Natural Gas Customers (Residential)	214,561	219,138	2.1%	220,212.4	216,835.3	1.6%
Natural Gas Customers (Industrial)	235	241	2.6%	235.9	242.8	-2.8%
Telephone Lines in Service (Mt. Bell)(Residential)	228,297	231,655	1.5%	229,706.8	226,219.8	1.5%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	110,594	111,826	1.1%	110,769.2	109,678.8	1.0%
Utah County						
Non-Ag. Employment (thous.)	78.0r	80.9fo	3.7%	75.9	73.5	3.3%
Unemployment Rate	5.1r	3.9	-23.5%	4.7	7.2	-34.6%
Auth. Permit Construction (thous. of dol.)	14,046.7	8,401.2	-40.2%	10,109.1	12,575.1	-19.6%
New Dwelling Units (no.)	78	41	-47.4%	63.8	93.3	-31.6%
Postal Receipts (thous. of dol.)	948.0	1,242.1	31.0%	1,130.3	931.8	21.3%
Electric Customers (Residential)	51,470	52,231	1.5%	52,146.8	51,829.3	0.6%
Electric Customers (Commercial)	5,856	6,057	3.4%	5,959.4	6,338.3	-6.0%
Natural Gas Customers (Residential)	59,952	61,650	2.8%	61,553.8	60,191.9	2.3%
Natural Gas Customers (Industrial)	69	69	0.0%	67.8	68.3	-0.7%
Telephone Lines in Service (Mt. Bell)(Residential)	64,122	65,750	2.5%	64,409.3	62,337.8	3.3%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	19,347	20,888	8.0%	19,916.4	18,238.8	9.2%
Weber County						
Non-Ag. Employment (thous.)	60.1r	62.0fo	3.2%	61.1	60.3	1.4%
Unemployment Rate	6.2r	4.9	-21.0%	5.9	7.0	-16.8%
Auth. Permit Construction (thous. of dol.)	9,923.4	4,426.1	-55.4%	5,577.7	8,460.1	-34.1%
New Dwelling Units (no.)	55	49	-10.9%	47.3	69.3	-31.7%
Postal Receipts (thous. of dol.)	563.1	660.2	17.2%	659.7	615.5	7.2%
Electric Customers (Residential)	52,885	53,480	1.1%	53,437.4	52,702.4	1.4%
Electric Customers (Commercial)	4,906	4,915	0.2%	4,923.9	4,830.0	1.9%
Natural Gas Customers (Residential)	48,590	49,379	1.6%	49,689.8	48,906.5	1.6%
Natural Gas Customers (Industrial)	86	84	-2.3%	83.2	85.0	-2.2%
Telephone Lines in Service (Mt. Bell)(Residential)	46,098	46,764	1.4%	46,366.7	45,862.4	1.1%
Telephone Lines in Service (Mt. Bell)(Nonresidential)	11,300	12,116	7.2%	11,741.8	10,901.8	7.7%

NA Not Available r Revised fo Forecast

Sources:

Personal Income:	Bureau of Economic Analysis, U.S. Department of Commerce.
New Corporations:	Utah Secretary of State.
New Car and Truck Sales:	Utah State Tax Commission, Economic and Statistical Unit.
Agriculture:	U.S. Department of Agriculture, Agriculture, Utah: Utah Crop and Livestock Reporting Service.
Construction Data:	F.W. Dodge Statistics and Utah Construction Report, Bureau of Economic and Business Research.
Employment Data:	Utah Department of Employment Security.
Savings Information:	Utah Savings and Loan Institutions.
Tax Collections:	Utah State TAx Commission.
Net Electric Power Utilized:	Cooperating Utah power companies.
Crude Oil Production:	Area oil refineries.
Natural Gas Production:	Utah Department of Oil, Gas, and Mining.
Coal Production:	U.S. Department of Energy.
Air Passengers:	Salt Lake City International Airport, Statistics Division.
Highway Traffic Count:	Utah Department of Transportation.
Visits to State and National Parks and Monuments:	U.S. Forest Service, Utah State Parks and Recreation Department.
Utilities Data:	Cooperating Utah utility companies.
Postal Receipts:	Postmasters in Davis, Salt Lake, Utah and Weber Counties.

Footnotes:

1 Obtained from F.W. Dodge Statistics.
2 Obtained from Utah Construction Report.
3 Includes services by nonprofit and religious organizations.
4 Includes public schools and college institutions.

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NATIONAL DATA	Oct 1987	Oct 1988	% Change From Year Ago	12 Month Average This Year	12 Month Average Last Year	12 Month Average % Change
U.S. Gross National Product (seasonally adjusted) (bil.) (qtly.)	4,662.8	4,995.2	7.1%	4,807.7	4,467.0	7.6%
Total Personal Income (seasonally adjusted) (bil. of dol.)	3,897.2	4,178.3	7.2%	4,017.1	3,729.7	7.7%
Industrial Production Indexes (seasonally adjusted) (1977=100)	132.5	139.4	5.2%	136.1	128.6	5.8%
Total Non-Farm Bus. Expend. on New Plants & Equip. (bil.) (qtly.)	406.8	445.7	9.6%	425.4	384.5	10.6%
Index of Leading Indicators (1982=100)	141.8	143.9	1.5%	150.2	184.3	-18.5%
Price Indexes						
Consumer Price Indexes (not seasonally adjusted) (1982-84=100)						
CPI-U (All Urban Consumers) All Items	115.3	120.2	4.2%	117.4	112.8	4.1%
CPI-U (All Urban Consumers) Food & Beverages	114.3	120.3	5.2%	117.2	112.9	3.8%
CPI-U (All Urban Consumers) Housing	115.5	119.0	3.0%	117.7	113.5	3.6%
CPI-U (All Urban Consumers) Transportation	107.1	110.0	2.7%	108.2	104.3	3.7%
CPI-U (All Urban Consumers) Medical Care	132.3	141.2	6.7%	137.2	129.0	6.4%
CPI-U (All Urban Consumers) Energy	89.8	89.9	0.1%	89.2	87.4	2.1%
Producer Price Index (not seasonally adjusted) (1982=100)						
Producer Price Index, All Finished Goods	106.2	109.3	2.9%	107.3	104.9	2.3%
GNP Price Deflator (1982=100) (qtly.)	118.9	124.0	4.3%	120.9	117.0	3.3%
Civilian Employment (seasonally adjusted)						
Total Civilian Labor Force (mil.)	120.4	122.1	1.4%	121.3	119.5	1.6%
Total Civilian Employment (mil.)	113.2	115.6	2.1%	114.6	111.9	2.4%
Unemployment Rate	6.0	5.3	-11.7%	5.6	6.4	-12.2%
Construction						
Total Construction (mil. of dol.)	23,360.2	20,313.1	-13.0%	20,253.8	21,110.7	-4.1%
Residential	10,289.7	9,996.0	-2.9%	9,647.7	9,975.0	-3.3%
Nonresidential	9,402.9	6,939.4	-26.2%	6,965.7	7,347.3	-5.2%
Non-Building	3,667.6	3,377.7	-7.9%	3,638.7	3,811.0	-4.5%
New Dwelling Units (no.)	130,314	117,891	-9.5%	117,649.7	134,058.5	-12.2%
Interest Rates						
Short Term (3-month Treasury bill rate)	6.40	7.34	14.7%	6.3	5.8	9.8%
Long Term (30-year Treasury bond yields)	9.61	8.89	-7.5%	9.0	8.4	6.6%
Prime Rates Charged by Banks on Short-term Business Loans (ave.)	9.07	10.00	10.3%	9.1	8.0	13.4%
Mortgage Rates (new homes)	8.86	8.77	-1.0%	8.8	9.0	-2.7%

Sources: Business Conditions Digest, U.S. Department of Commerce: U.S. Gross National Product, Total National Personal Income, Industrial Production Indexes, Total Business Expenditures for New Plant Equipment, Index of Leading Indicators, GNP Price Deflator, National Employment Data, Interest Rates.

F.W. Dodge Report, McGraw-Hill: National Construction Data.

Survey of Current Business, U.S. Department of Commerce: New Home Mortgage Rates.

Utah Labor Market Report, Utah Department of Employment Security: Consumer Price Indexes, Producer Price Index.

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